

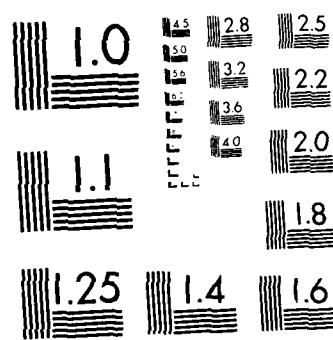
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CARDIFF (WALES) R H WILLIAMS 30 APR 86
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METAL CONTACTS ON SEMICONDUCTORS

Principal Investigator: Professor R H Williams
Contractor: University College, Cardiff
Contract Number: DAJA 45-84-C-0028
4th Periodic Report: 1st November 1985 - 30th April 1986

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FOURTH INTERIM REPORT

A detailed study has been made of the methods that are used to estimate the magnitude of the Schottky barrier height at metal/semiconductor interfaces. The results of this study have clearly demonstrated that the conventional procedures for extracting the barrier height from a measurement of a diodes I-V characteristics often provide an underestimate. Therefore a new method has been developed for analysing the I-V characteristics. The method correctly takes into account the effects of the recombination generation current, the voltage dependence of the barrier height and the effect of a large series resistance. The barrier height is obtained using a graphical method which utilizes both the forward and reverse biaised characteristics. The method has been tested using a recently designed automatic data acquisition system. As a result, the element of subjectivity which is often involved in barrier height measurements has been substantially reduced.

In addition a detailed study has been made of the voltage dependence of the recombination current. In particular the dependence of the recombination currents on the recombination centre spatial and energy distributions. A graphical procedure has been developed for testing the quality of a metal - semiconductor interface and it is envisaged that the technique could be used on a routine basis to test the quality of interfaces fabricated by MBE or MOCVD.

Detailed microscopic studies of a number of metals with GaAs and InP clean and oxidised surfaces have also been carried out using photoelectron spectroscopy. These interactions are being related to the Schottky barrier heights measured by I-V and C-V methods. The stability of these contacts as a function of time and temperature is also being probed.

In October 1985, Alistair McLean, the Research Assistant on the grant moved on to another post. We have now appointed Dietrich Zahn to this position and he commenced duties on March 1st, 1986. He is an expert in using Raman spectroscopy to study interfaces and we are setting up to carry out such experiments in our own laboratories. This technique is potentially extremely valuable to study buried surfaces and interfaces.

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